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DISEASES OF THE CHEST

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Editorial Comment

IT IS SPRINGTIME IN MISSOURI Doctor, we are looking forward with pleasure to seeing you at St. Louis on May 13-14. The Fifth Annual Meeting of the American College of Chest Physicians will be held on those days at the Chase Hotel. The committees in charge of the arrangements have spared no efforts in preparing an excellent program for your enjoyment, and advance reservations indicate that this meeting will have a larger attendance than any held heretofore.

On Saturday, May 13th, there will be committee meetings, open house at the Robert Koch Hospital, the largest Tuberculosis Hospital in Missouri, and a dinner that evening for the Board of Regents and the House of Governors.

Sunday morning, May 14th, there will be an Administrative Session and election of officers. At noon, Dr. Joseph F. Bredeck, Health Commissioner of St. Louis will address a luncheon meeting. He will speak on "Controlling Pneumonia in St. Louis," and he will be introduced by Dr. Alphonse McMahon, President of the St. Louis Medical Society. A splendid Scientific Program has been arranged for Sunday afternoon, when outstanding men in the field of chest diseases will discuss papers of current interest to all physicians. The day will be concluded with a banquet and dance that evening at the Chase Hotel.

On Monday, May 15th, the meeting of the American Medical Association will get under way. This is by far, the greatest assembly of physicians in the world. The vast assembly halls will house scientific and commercial exhibits which are at all times an outstanding feature of these annual meetings. Papers on every conceivable phase of medicine will be presented in an interesting manner by competent speakers in the various Sections. Good fellowship and reunion with old friends are always a pleasant part of these meetings. We can think of no better way of combining a vacation with a post graduate course in medicine.

Any physician who would like to attend the Scientific Sessions or the social functions of the American College of Chest Physicians, and who is not a fellow of the College, can obtain a guest card by writing to the Secretary of the College at P. O. Box 1069, El Paso, Texas. The guest cards are limited to the seating capacity of the assembly hall, and they will be mailed out in the order in which the requests are received. R. B. H., Jr.

THE EYES OF THE NATION ARE UPON YOU! Physicians, public health officials, and social agencies, will be watching with interest a tuberculosis meeting to be held at San Antonio on May 8.

The meeting has been called by the Tuberculosis Committee of the State Medical Association of Texas, in keeping with the plan of organization proposed under the Pennsylvania Plan, sponsored by the American College of Chest Physicians.

Texas has organized tuberculosis committees in forty five counties throughout the state and there are seventy five physicians serving on these committees. In addition to these committee members, invitations have been mailed to the State Health Department, the State Sanatorium, the State Tuberculosis Association, and to the fellows of the American College of Chest Physicians in Texas. This is the first time in the history of Texas, that all of the agencies interested in the control and treatment of tuberculosis will gather under one roof and attempt to formulate a workable program.

The Woodmen of the World Memorial Hospital at San Antonio, one of the finest sanatoria in the country, will house the meeting, the officials of the sanatorium will act as hosts, and a dinner will be served to the invited guests at seven o'clock.

We are pleased to note that organized medicine is taking the lead in sponsoring this cooperative movement. This is as it should be, and we trust that the other states will follow suit. The eyes of the nation are upon you, Texas.

R. B. H., Jr.

CHILD HEALTH DAY.... The first of May will be observed over the country as Child Health Day, with exercises sponsored by National and local societies and particularly by the Children's Bureau of the United States Department of Labor. Special emphasis will be placed this year on problems of nutrition. Because of the importance of the subject of Nutrition in connection with the tuberculosis problem, each member of the American College of Chest Physicians should take a part in the program of Child Health Day.

In years past, this movement has been more or less discredited in the eyes of the average physician. Recently, however, two things have happened. First, the Medical Profession has liberalized its views and second, those in authority have modified their policies to conform with whatever may be the views of the Medical Profession concerning the matters involved.

The importance of liaison between movements of this kind and the medical profession should be understood at once, because except for the intervention of representatives of the medical profession, medical ethics may unintentionally be violated, in a number of particulars. For instance, arrangements have been made with a number of radio stations to broadcast certain programs. The American Medical Association will furnish two especially prepared articles for this purpose. Physicians will be asked to read them, or perhaps to prepare and present articles of their own. It is obvious, therefore, that if a member of the American College of Chest Physicians is called upon to prepare and present an article that it would be something on the relation of nutrition to tuberculosis. The same would be true, also, of speakers appointed to address various audiences.

It seems that it would be very desirable that all members of our College put the stamp of approval on Child Health Day, and assist in every way possible in keeping the proper liaison between the medical profession and the lay officers of this movement.

C. M. H.

WHY NOT A SECTION ON DISEASES OF THE CHEST? It has been the hope of the Fellows of the American College of Chest Physicians that a section on diseases of the chest be established in the annual program of the American Medical Association meeting. It is the opinion of many, including the various chairmen and secretaries of the Section on Practice of Medicine, that at least a half day be devoted to diseases of the chest in this section.

In studying the program for the St. Louis Meeting, we find eleven interesting papers on subjects pertaining to diseases of the chest scattered through seven different scientific sections. Of the subjects to be presented in this year's complete program, there are only two pertaining to tuberculosis; namely tuber-

culosis among hospital personnel, and tuberculosis control. There are no papers pertaining to collapse therapy or surgery of the chest. Under the present arrangement, it is necessary for a man who wishes to present a paper pertaining to diseases of the chest to take his chance on getting it either in this section on The Practice of Medicine, Pediatrics, Pharmacology and Theraputics, Pathology and Physiology, Preventative and Industrial Medicine and Public Health, or one of the general scientific meetings.

Surely no one will question the importance of diseases of the chest among the various medical problems to be met by the medical profession. Therefore, it seems very logical indeed that this subject could be treated to a greater advantage for all concerned if it were given a definite place in the program of the scientific assembly.

We realize that the American Medical Association is confronted with the problem of numerous sections clamouring to be admitted each year. However, this would not be a new section in the true sense of the word, if the views of the various chairmen of the section on the Practice of Medicine are carried out; namely, that one half day in the Section on Practice of Medicine be devoted to diseases of the chest.

C. M. H.

COOPERATION OF THE GENERAL PRACTITIONER WITH TUBERCULOSIS AGENCIES

The cooperation of the general practitioner is twofold: 1st, through his medical organizations, 2nd, as an individual.

I. In accordance with the Pennsylvania Plan, the general practitioner, through tuberculosis committees of his county medical society and state medical society, endeavors to help the county tuberculosis committee in its educational field. This is accomplished by the promotion of tuberculosis papers in the medical society, by organizing programs, by cooperating with his county and state public health officials and by keeping them informed on conditions in the county and state tuberculosis sanatoriums and clinics. In this, he is guided by his tuberculosis committees.

The general practitioner should acquaint himself with the aims and policies of the leaders in tuberculosis in his organizations, who have given special study to the various ramifications of the tuberculosis problem, so that he can loyally support his own organizations' program. Hostile reaction on the part of an individual, contrary to the expressed policy of his own organization can and has in the past, disrupted the tuberculosis fight.

II. As an individual, the general practitioner should:

1. Promote and cooperate with tuberculosis surveys in all groups where the tuberculosis incidence of infection is high;

2. Seek the early case with sputum tests and x-rays upon the first suspicion of possibility of tuberculous infection through either symptoms or tuberculous contacts;

3. Cooperate with the local tuberculosis specialist or clinic, realizing that the cure of tuberculosis is in a highly specialized field today;

4. Report every diagnosed case of tuberculosis and tuberculosis death fearlessly and justly, for the sake of present public health, and for that of the generations to come;

5. Cooperate with the county component of the National Tuberculosis Association by: First, education of that part of the public with which he comes in contact, with the responsibilities, duties, and limitations, of the National Tuberculosis Association; Second, assisting with the sale of Christmas seals—Every Doctor's Office a Sales Booth!

Selling seals gives an opportunity for education of the public. Your editor tried it as an experiment in his private office during the last eight days of the recent seal campaign. I am convinced that the $60.00 collected was less important than the opportunity afforded for education of my part of the public, in the importance, work and ideals of the National Tuberculosis Association.

The ideals of the National Tuberculosis Association can never be reached without the cooperation of the general practitioner, organized and as an individual. If these ideals are not reached pretty soon we are going to have Political Medicine, so I call on every general practitioner to lend an informed and energetic and cooperative hand in the Tuberculosis Fight.

F. W. B.

Sulfapyridine in the Treatment of Pneumococci Pneumonia Based Upon Treatment of 350 Cases*

HARRISON F. FLIPPIN, M.D.
Philadelphia, Pennsylvania

DURING the past year there have appeared in the British and American literature encouraging reports on the use of sulfapyridine (M & B 693) in the treatment of pneumococcal infections. The available laboratory [1, 2, 3, 4] and clinical [5, 6, 7] data suggest that this new chemotherapeutic agent is highly effective against the pneumococcus, and there is reason to believe that it will find widespread use in the treatment of pneumococci pneumonia. Most of the clinical reports have stressed the frequency in which the initiation of drug treatment is followed within 24 to 36 hours or less by a critical drop in temperature. This temperature drop is not immediately accompanied by any significant change in the lung signs, but always reflects a marked improvement in the toxemia and general wellbeing of the patient. Resolution of the pneumonia then follows within a variable period of days, although we cannot say whether resolution is hastened or retarded by the fall in temperature. The critical drop in temperature is followed within 12 to 24 hours by a marked drop in the total leukocyte count. This, we believe, represents a favorable sign, since in cases where the white blood count remains elevated, despite adequate drug therapy, the usual clinical improvement is retarded. In some instances there is a recurrence of low grade fever which persists for several days after the initial critical drop. From the reports in the literature and personal communications we found that the mortality rate in sulfapyridine treated cases is about 7 per cent.

As with any new therapeutic agent, certain points should be made about its mode of administration, dosage and toxic effects. At this time there are no definite rules as to the amount of drug that should be given. This is partly due to our inability to predict what constitutes an effective blood level of sulfapyridine in patients with pneumonia. Experience thus far fails to show any correlation between the blood sulfapyridine level and the therapeutic effect. In elderly individuals and in young persons with renal impairment we find that the blood levels are uniformly high. On the basis of our experience and that of others we are adhering to the following dose schedule in adult patients.

An initial dose, by mouth, of 2 gm. (30 grains), followed every 4 hours by 1 gm. (15 grains), until the required total dosage as outlined below is given:

(1) Patients treated during the first 5 days of the disease receive a total of 25 gm. (375 grains).

(2) After the fifth day 15 gm. (225 grains) is sufficient in most instances.

(3) All cases of bacteremia should receive at least 25 gm. (375 grains) and usually more; sometimes a total of 50 gm. (750 grains) is necessary.

(4) In elderly patients and those with renal involvement a total dosage of 15 gm. (225 grains) will often suffice.

(5) When there is evidence of spread in the pneumonia, despite a normal temperature, a larger total dose is advisable.

(6) In cases where specific serum has been used without apparent success, sulfapyridine should be given as outlined above.

(7) The failure of a patient to show clinical improvement after 48 hours of adequate sulfapyridine therapy is considered by some an indication for specific serum. So far our experience with this form of treatment is limited, as we have had but several occasions in which to test its real value.

In the treatment of infants and children we have been giving 1½ grains per pound of body weight every 24 hours in divided doses. The total dosage in this age group has varied with the individual case.

Toxic Effects

As with sulfanilamide, the toxic effects of sulfapyridine are sufficient to require close observation of the patient and careful usage

* These cases will be reported in detail by H. F. Flippin, J. S. Lockwood, D. S. Pepper, and L. Schwartz.

of the drug. The most troublesome and most frequent untoward effects of the drug are nausea and vomiting. Both are most likely to appear during the first 24 hours of treatment and are probably of central origin, rather than local gastric irritation. The following methods have been used to control the nausea and vomiting and in individual cases each of these adjuvants appear to improve the tolerance for the drug:

(1) The administration of small amounts of sodium bicarbonate after ingestion of the drug.

(2) Mixing of the drug with water, fruit juices, or milk.

(3) Omission of treatment for one or two doses, followed by its resumption.

(4) The use of barbiturates and chloral hydrate.

(5) The introduction of sodium chloride and dextrose, intravenously, is advisable in all patients who show nausea and vomiting. This appears to be a valuable method of minimizing these symptoms as well as of restoring normal fluid and electrolyte balance in the patient who is vomiting.

The extreme insolubility of the drug has made impractical its administration through the rectum. We have tried unsuccessfully the use of an enteric coated tablet by mouth. The other toxic reactions which we have observed or have been reported include cases of transient hematuria, dermatitis, acute hemolytic anemia, leukopenia, drug fever, and agranulocytosis [8]. Cyanosis does occur, but its presence does not necessitate the withdrawal of the drug. It seems that aside from the nausea and vomiting these toxic reactions do not occur as frequently with sulfapyridine as with sulfanilamide.

In view of the above toxic effects, it is advisable to watch the urine closely for red cells, acetone and urobilin, and the blood count for signs of progressive anemia and neutropenia. In elderly patients the blood urea nitrogen level should be checked and, in those with severe vomiting, blood chloride studies are indicated.

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Tuberculin Tests on Student Nurses

G. H. C. JOYNT, M.D.
London, Ontario, Canada

MANY changes in medical opinion as to the prevalence of tuberculosis have occurred in the past few years as a result of the increased number of tuberculosis surveys. Perhaps the most notable change has been in relation to tuberculin testing. Only five years ago, medical students were taught that 90 to 95 per cent of young adults were tuberculin positive and that by the time adult life was reached a positive reaction was practically universal. It was considered then that the tuberculin test was only of value in children of the pre-school age and public school group. This was the general view and a review of the literature as late as 1929 to 1930 confirms this opinion.

The systematic use of the tuberculin test in Scandinavian countries and in German and American Universities over the past few years has gradually modified this view. The tuberculin tests made on American college groups between 1931 and 1936 showed impressive changes. Soper's results at Yale from 1931 to 1932 showed that 62 per cent of the students entering college had a positive tuberculin reaction, whereas in 1935 to 1936 this percentage had dropped to 48.4 per cent. Other investigators have noted similar results in the decreasing percentage of positive reactions in young adults. As a result of a study of the findings of numerous tuberculin surveys and an analysis of the results of tuberculin tests on a series of student nurses, I am of the opinion that the tuberculin test

is not only of definite diagnostic value in young adults, but also of importance in showing that the actual incidence of tuberculosis infection is slowly decreasing.

Clinically it has been noted that a positive tuberculin test may appear as early as twenty-one days following the exposure to tuberculosis. Tuberculin and protein reactions in general appear to be "specific" when they can be elicited by extremely dilute solutions, but in the terminal stages of tuberculosis and in acute miliary disease where the body is overwhelmed by infection, skin hypersensitiveness may be lowered or even lost. Other conditions such as intercurrent infection, pregnancy, parturition and menstruation may also temporarily diminish the capacity of an individual to react to tuberculin. With the return to a normal physiological state, however, hypersensitiveness is quickly restored.

Inasmuch as a positive test indicates that the body has at some time become infected with tubercle bacilli, it does not of necessity indicate active tuberculosis at the time of the test. If the tuberculous lesion heals completely, the tuberculin sensitiveness may theoretically disappear. Whether it ever completely disappears is still a matter of controversy, but it is probable that the complete resolution of all pathological activity in every tuberculous focus in the body will result in loss of hypersensitiveness. McPhedran and Opie have found negative tuberculin reactions in approximately 5 per cent of persons with calcified tuberculous foci. These lesions were regarded as obsolete.

Occasionally the objection is raised that the general application of the tuberculin test is apt to be followed by reactivation of a tuberculosis previously quiescent. Such fears are not well grounded. The introduction of tuberculin into the body of an individual who has never been infected with tubercle bacilli gives a negative test, while the introduction of tuberculin within the skin of a tuberculous patient is not attended by any serious mishaps. The ill effects reported are those of subcutaneous and not the intracutaneous application. The accepted procedure now is the injection of dilute solutions of tuberculin followed by more concentrated solutions if the test is negative, thus avoiding any accident or local necrosis.

A survey of tuberculin tests on a group of student nurses was made over a four year period ending June, 1938. The nurses included in this survey were registered at five general hospitals in Western Ontario—Hospital 1, 428 beds; Hospital 2, 300 beds; Hospital 3, 128 beds; Hospital 4, 125 beds; and Hospital 5, 86 beds. The tuberculin tests were performed by a member of the staff of the Queen Alexandra Sanatorium at the hospital chest clinic, using the Mantoux or intracutaneous method.

The nurses were first tested shortly after enrollment with 0.1 mgm. injection of old tuberculin which was freshly diluted in the sanatorium laboratory. If the tests were negative the 0.1 mgm. dose was repeated at approximately three month intervals and a final test was made on graduation. Those nurses showing positive reactions were further studied at the chest clinic by means of a complete medical history, chest examination and a flat roentgenogram of the chest.

Since April, 1937, the following procedure has been used routinely at Hospital 1. All probationers are first given an injection of 0.5 mgm. of old tuberculin. One week later 0.1 mgm. is given to all negative reactors and the following week 1.0 mgm. of old tuberculin (0.1 cc. of 1:100 dilution) is given to the remaining negative reactors. If the test is still negative, a 0.1 mgm. dose is repeated at three month intervals and the 1.0 mgm. test is done once a year.

It is interesting to note that a recent amendment to the Public Hospital Act of Ontario requires each employee of any hospital (this includes pupil nurses) to receive a tuberculin test within thirty days after entering the employ of the hospital and, if the reaction is negative, the test must be repeated once each year. If the reaction is positive, an x-ray examination of the lungs must be carried out within thirty days after the result of the test is determined and where the employee is less than thirty-five years of age, an x-ray must be taken at least once a year.

In this survey a total of 709 probationers were tested over a four year period. The minimum age requirement for these probationers was 18 years. The average age was approximately 19 years. Of the 709 probation-

ers tested, only 187 or 26 per cent showed positive reactions (see Table I). And although student nurses may be considered a more or less select group, the results of these tests show a remarkably low percentage of positive reactors.

TABLE I.

Tuberculin Tests on Probationers
(September, 1933 — March, 1938)

	Number	*Positive*	*Per cent Positive*
Hospital 1	335	91	27
Hospital 2	202	61	30
Hospital 3	74	16	22
Hospital 4	32	6	19
Hospital 5	66	13	20
TOTAL	709	187	26

As previously stated, the nurses were tested throughout their undergraduate course and a final tuberculin test was made on graduation. Only those classes registered from September, 1933 to March, 1935 had graduated when this survey was completed. There were 223 probationers in this group, 42 of whom did not complete their courses. Of the nurses who resigned 20 were positive reactors and 22 negative reactors. It is noted in Table II that only 24 per cent of the nurses in this group showed positive tests on enrollment whereas, on graduation after three years in the wards of a general hospital, there were 57 per cent positive. This is quite a marked increase in positive tests over a three year period.

TABLE II.

Tuberculin Tests on Enrollment and on Graduation

ON ENROLLMENT

	Number	*Positive*	*Per cent Positive*
Hospital 1	121	30	25
Hospital 2	63	17	27
Hospital 3	28	5	18
Hospital 5	11	2	18
TOTAL	223	54	24

ON GRADUATION

	Number	*Positive*	*Per cent Positive*
Hospital 1	92	59	65
Hospital 2	53	28	53
Hospital 3	26	14	54
Hospital 5	10	3	30
TOTAL	181	104	57

At Hospital 1 complete records of the former residence of probationers were obtained. In this small series of 335 nurses who had an average of 27 per cent positive reactors (see Table I), there were 238 probationers from rural homes and 97 from urban homes. The rural group showed 23 per cent with a positive reaction which was slightly less than the average for this hospital and the urban probationers had 37 per cent with positive tests. Although this is a small group there appears to be a distinct contrast in the incidence of tuberculosis infection in rural and urban probationers.

TABLE III.

Tuberculin Tests on Probationers at Hospital 1, 1933-1938

	Number	*Positive*	*Per cent Positive*
Rural	238	55	23
Urban	97	36	37

Too much emphasis cannot be placed on the importance of the change in attitude in regard to tuberculin testing young adults. Although the reporting of persons who do not show any evidence of tuberculosis, except the positive tuberculin reaction, is strongly opposed at the present time, it may eventually be considered an important part of the tuberculosis control program.

Data has already been accumulated to show that, contrary to general belief, the positive tuberculin reaction in infancy does not portend to a grave prognosis *per se*. Wallgreen has pointed out that children who have contracted a tuberculous infection have to pass through two essentially different periods of danger. The first period begins when the primary infection manifests itself and this lasts about three months. When an infected child has safely passed this danger period, it enters into a rather harmless one which lasts until the beginning of puberty. Then begins the second danger period which lasts two to three decades and during which those who are infected may become prey to pulmonary tuberculosis of the adult type. Harrington, Myers and Levine have also stressed the importance of close observation of all adolescent children and adults with a positive tuberculin test.

Boynton, Diehl and Shephard in their recent report on tuberculosis case-finding among University of Minnesota students, found that only 14 per cent of the students

with a positive tuberculin test showed any x-ray evidence of tuberculous infection. They also pointed out that 25 to 30 per cent of the cases of adult-type tuberculosis would have been missed on routine examination without the use of the Mantoux test and subsequent x-ray chest films on the positive reactors.

Summary

A survey of the tuberculin tests on 709 student nurses at five general hospitals over a four year period was made. The actual incidence of tuberculosis infection, as shown by the positive tuberculin, was only 27 per cent on enrollment.

A comparison of the tuberculin reactions on enrollment and on graduation was reviewed on a series of nurses. It was found that the percentage of positive reactors had increased from 24 per cent on enrollment to 57 per cent on graduation.

The probationers at Hospital 1 were classified as to former residence. In this small series of 335 nurses it was noted that there were only 24 per cent with positive tests in the rural group. The urban group, on the other hand, showed 37 per cent with positive reactions.

It may be difficult to translate correctly the results of this survey but the necessity and importance of the tuberculin test is thereby emphasized. The attitude in regard to tuberculosis as a contagious disease appears to be changing. Children were known to be susceptible, but for years little or no protection was given to adults. Surveys in medical and nursing schools have shown the danger of spread of the disease in young adults.

Although the death rate from tuberculosis has shown a remarkable reduction in the past quarter century, tuberculosis still accounts for more deaths in young adults than any other disease. The real problem appears to be early diagnosis. In the past there has been a tendency to concentrate on symptoms and physical signs, but frequently these are not present until the disease has reached a far advanced stage. Thus it is evident that the lesion must be discovered before the onset of definite symptoms or signs and the success of an active program for finding the disease appears to be based on mass tuberculin testing and x-ray examination.

The author desires to thank Dr. D. W. Crombie for assistance and advice in preparing this paper and also to acknowledge the cooperation of the supervisors in charge of student nurses at the hospitals mentioned.

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OBITUARY

RALPH B. SCHEIER, M.D.
1880 - 1939

Dr. Ralph B. Scheier, a fellow of the American College of Chest Physicians died at his home in San Francisco, California, on February 25, 1939, after a prolonged illness.

Dr. Scheier was born in San Francisco in 1880, and he received his education in that city, graduating from the University of California in 1901, and from the College of Physicians and Surgeons in 1908. He practised medicine at San Francisco until a few months prior to his death.

In 1916, Dr. Scheier started the Canyon Sanitarium at Redwood City, California, for the care of tuberculous patients. Under the personal guidance of Dr. Scheier, the institution grew and prospered. It stands today as a monument to his endeavors in the work which he loved best.

B. F.

The Early Diagnosis of Pulmonary Tuberculosis

JOSEPH N. CORSELLO, M.D.*
Wallum Lake, Rhode Island

DESPITE a steadily declining death rate and increasingly greater success in treating the disease, much remains to be done before tuberculosis can be brought under complete control. This disease is still the greatest destroyer of young adult life and its incidence remains sufficiently high as to constitute a burden on the national economy.

Prerequisites to more effective control are (1) betterment of economic and environmental conditions among the underprivileged and (2) more efficient case-finding, with emphasis on early diagnosis.

Studies have revealed that a substantial percentage of the population is at present living under unsatisfactory conditions. It is generally accepted that substandard living conditions contribute greatly to the morbidity and mortality of tuberculosis. Little improvement in the tuberculosis index among these underprivileged can be expected until this situation is materially bettered. This problem is, of course, primarily one for economists and sociologists to ponder on.

The question of more efficient case-finding, however, concerns the medical profession. Surveys show that most patients have advanced disease when first diagnosed. Up to 80 per cent of the yearly admissions to the sanatoria of the country have greater than minimal lesions. Furthermore, in spite of the intensive anti-tuberculosis campaigns of recent decades, the ratio of minimal to advanced cases has not improved appreciably. Undoubtedly, this shortcoming in early diagnosis has been a considerable handicap to more effective control. Not only are chances of dissemination to others improved by delayed diagnosis, but the prognosis, resultant disability and cost of treatment are also influenced by the extent of the disease.

A weakness in our anti-tuberculosis structure has been the failure of general practitioners to take a more prominent role in the fight against the disease. This statement must in no sense be construed as being an indictment, but rather as a plea for greater cooperation. The sincerity and desire of the family doctor to see tuberculosis subjugated cannot be questioned. Yet this structural fault exists and must be corrected before the case-finding machinery can function with maximum efficiency. Despite the intense specialization of recent years, the practitioner remains the central figure in the practice of medicine. It is he who is first consulted by the patient and, without his intelligent cooperation, highly specialized agencies for diagnosis and treatment are greatly handicapped.

A specific cure for tuberculosis has yet to be discovered. Nevertheless, there is a feeling shared by many that the weapons are now available with which to completely eliminate the disease or else reduce it to a point of relative unimportance. This aim could be fulfilled if all cases were discovered early and promptly isolated. Because of the diversified nature of tuberculosis the only adequate proposal that could be offered is that of periodic x-ray examination of the general population. Under present conditions it is questionable whether this would be practical. Yet much could be accomplished if efforts were concentrated on those groups that show the highest incidence rates such as family and other intimate contacts of known cases, particularly those between 15 and 28 years of age. It has been shown that the onset of secondary or re-infection tuberculosis is most frequent in this period of life.

Routine examinations of such groups will frequently bring to light previously unsuspected advanced cases as well as many with early disease. These observations must be made without regard to the presence or absence of symptoms. Early tuberculosis is frequently without symptoms and to await their appearance is to invite disaster because of the progressive tendency of the disease if untreated. Often by the time symptoms are manifested the lesion is found to have progressed to an advanced stage. In a survey

* Rhode Island State Sanatorium.

of 51 patients with minimal pulmonary tuberculosis currently in the Rhode Island State Sanatorium, 21 or 42 per cent had either no symptoms or else such slight symptoms as to arouse no anxiety on the part of the patient. Diagnosis in each case was made by means of routine x-ray examination because of previous exposure. Undoubtedly, some of these would have progressed to a more advanced stage had examination been delayed until the appearance of symptoms. Similar figures have been reported from other institutions.

These routine examinations should include a tuberculin test and chest x-ray of all positive reactors. Considered from a practical standpoint, tuberculin testing can well be dispensed with in adult contacts in those areas where there is a high percentage of positive reactors among this group. However, in no case except where the tuberculin test is negative should x-ray examination be omitted. If the test is negative, it is wise to repeat it after an interval of a month or two in order to avoid passing up any recently infected individual in whom tuberculin sensitivity had not yet developed. Those definitely tuberculin negative, indicating freedom from infection, can be eliminated from further observation—providing contact has been broken.

One or two negative x-rays give no assurance of continued later freedom from tuberculosis. For the sake of consistency, x-rays should be taken periodically until the end of the period of greatest danger or until the age of 28. The usual interval between examinations is one year. With unbroken contact, however, it should not be greater than 3 to 6 months. In contacts older than 28, observations need not extend beyond a two-year period after exposure ceases.

Tuberculosis follows no typical or uniform clinical pattern. Because of this its diagnosis in the course of routine medical practice is often difficult. Accordingly, it is frequently misdiagnosed. The best insurance against erroneous diagnosis is a tuberculosis consciousness. The disease recognises no social, economic or racial barriers and hence no one can be considered as being above suspicion.

The family and past personal histories should be painstakingly inquired into. A definite history of familial tuberculosis is significant. A statement that some member of the family succumbed to a supposedly acute respiratory infection should not be accepted at face value. Further questioning often brings out the fact that the terminal illness was of many months' duration, a finding more in keeping with tuberculosis than with an acute infection. Information should also be elicited regarding the presence of suggestive symptoms among living members of the family.

Important facts in the patient's past history are chest pain or pleurisy, particularly pleurisy with effusion, rectal abscess and repeated attacks of chest cold, grippe or pneumonia, especially if these illnesses have been associated with unduly prolonged periods of convalescence. A so-called "cigarette cough" calls for investigation because it is often associated with tuberculosis. The nature of the patient's work should be noted. Certain occupations such as sand-blasting and stone-cutting, which expose the worker to silicosis, bear a definite relationship to the incidence of the disease.

In considering the patient's complaints it is well to bear in mind the variety of ways in which pulmonary tuberculosis may manifest itself. At times the onset is most insidious while, occasionally, it may begin with an abruptness suggestive of acute lobar pneumonia. The course often is intermittent, there being periods during which slight symptoms can be noted alternating with symptomless periods when the patient may feel quite well. Frequently, tuberculosis is ushered in by what may appear to be an ordinary attack of grippe or bronchitis. The symptoms are usually most marked during the first week or two after which some improvement may be noted, but complete recovery does not follow. Occasionally the first warning sign will be a sudden frank hemoptysis. It is well to remember that the size and frequency of hemoptysis is no indication of the extent or character of the underlying pathology. In any event, thorough investigation is indicated because this symptom is usually of serious significance.

Fatigue is the most frequent early symptom of insidious tuberculosis. At first this may be noted by the patient only toward the end of the day's work and may be manifested by a loss of interest in evening social activi-

ties. The patient becomes nervous and irritable and the pulse accelerates more readily. The appetite loses its edge and a slow loss of weight follows. Cough may or may not be present at this stage, but when it first appears is often of a dry and hacking nature. Expectoration is usually a somewhat later symptom. The sputum at first is small in amount and may be present only in the morning. Later, if the disease goes on to cavity formation, both cough and expectoration may increase considerably. Fever, malaise, nightsweats, flushes and noticeable loss of strength are usually late manifestations of active tuberculosis. It should be pointed out that the absence of these late symptoms does not rule out activity. Other common symptoms are hoarseness or even aphonia and chest pain.

Whenever a suspicion of tuberculosis arises, an x-ray examination of the lungs is indicated. Valuable as physical examination is, its limitations in the diagnosis of this disease should be fully realized. Even in the hands of experts the stethoscope will fail to reveal significant findings in many cases of minimal tuberculosis and it is often misleading in more advanced lesions. While the x-ray film does not give absolute proof, it does offer the best available presumptive evidence of tuberculosis. Also, it is the only means we have of accurately estimating the extent and nature of the lesion. In the face of strongly suggestive symptoms an initial negative x-ray should not be considered conclusive. In such a situation it is best to keep the patient under observation and to repeat the x-ray at a later date.

The only absolute proof that a lesion is tuberculous is the finding of tubercle bacilli in the sputum. Yet in spite of the significance of a positive sputum examination, this important detail is often neglected. This is all the more surprising in view of the fact that in practically every community in this country facilities are available for sputum examination at little or no cost. The sputum should be examined if only to supply corroborative evidence. At the same time, it must be borne in mind that a negative sputum does not rule out the disease. This is especially true in early, non-cavernous tuberculosis.

Very occasionally a case may be encountered so unusual as to stump for a time even the best clinical minds. In such instances, a period of observation in a sanatorium is indicated.

The Value of Sanatorium Treatment from the Standpoint of the County Health Department*

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A DISCUSSION of the value of sanatorium treatment from the standpoint of the county health department should include a consideration of the mutual benefits to be derived from proper co-ordination of the activities of these two agencies. The marked expansion and improvement in county health work made possible by social security funds has intensified all health work, including tuberculosis control measures. Without the assistance and leadership of well conducted sanatoria, however, county health departments cannot obtain the best results from their tuberculosis efforts. By enumerating the various activities of a well planned county tuberculosis program we may see what influence the sanatorium has or could have on each activity.

The reporting of tuberculosis by physicians is mandatory in most states, but for various reasons we find that such reporting is incomplete. County health departments try in every way to improve reportation of tuberculosis, as well as all other communicable diseases. Offering home nursing service and state x-ray consultation work has induced many physicians to list their cases and contacts with

* Read before the Southern Tuberculosis Conference, Louisville, Ky., September, 1938.

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county health departments, but the best way to promote the reporting of tuberculous patients is to have the patients admitted to sanatoria without too much delay. Thus we see that a tuberculosis sanatorium, with an active treatment policy and a fairly rapid turnover of patients, actually assists in the maintenance of county records, spot maps and contact lists.

Although county health departments are not concerned with the administration of medical supervision for tuberculosis patients, they are able in most instances to offer physicians home nursing service and public health supervision for their patients. When patients, or members of the family, know that the county health departments have the backing and assistance of the sanatorium in securing sanatorium berths for suitable cases, it is easier for the private physician and the nurse to obtain their co-operation in proper medical and public health advice—until such time as the patient is hospitalized.

The short sighted policy of utilizing sanatorium beds for indefinite periods of isolation in far advanced and hopeless tuberculous patients, when beds are limited, should be made clear to county health department members. They, in turn, can explain to the physicians and the public the importance of a treatment policy rather than a vague sanatorium isolation program. Unfortunately, many county health officers feel that a very valuable service has been rendered the county when a hopeless isolation problem case is admitted to the sanatorium. Occasionally, such patients can be taught sanatorium routine and precautionary measures and returned home for continued satisfactory supervision and isolation by the county health department. Frequently, such patients become dissatisfied with sanatorium life when they fail to show expected improvement and return home—disregarding all teachings and precautions. For the most part, however, these isolation problem cases stay as long as the sanatorium policy will permit, occupying space in an institution that is equipped to do, and should be doing, intensive treatment of tuberculosis. I, therefore, list indefinite isolation of hopeless tuberculous patients as one of the less valuable contributions of the sanatorium to the county health department. Much could be done to develop less expensive ways of handling these isolation problems in the county.

With the development of state-wide x-ray consultation and case finding services, county health departments are in a position to sponsor and conduct earlier diagnosis programs through the cooperation of local medical groups. In conducting such a service, I am repeatedly asked what is to be done for the cases disclosed by these clinics. Fortunate indeed is the county health department which has access to a sanatorium that provides a short intensive treatment regime for a maximum number of well selected patients. When collapse procedures, which must be continued for long periods, are begun, arrangements must be worked out for ambulatory treatment clinics. Having sanatorium trained physicians located at strategic points over a state assures a successful subsequent case finding program, prompt sanatorium consideration of patients therein found, and adequate ambulatory care.

By having a receptive group of successfully treated tuberculous patients to deal with, a group of teaching disciples can be sent back into the counties if sanatorium physicians devote time and preparation to a series of talks on tuberculosis to be given over an address system, if available, or distributed in pamphlet form. Some patients already spend too much time reading about and discussing tuberculosis, but a well informed patient can be relied upon to assist county health departments in securing studies on home contacts.

The practice of periodically examining the sputum of all sanatorium patients should carry over into later follow-up work. It should be easy for sanatorium staff members to impress upon patients the importance of this public health procedure. I believe that culturing of the sputum should be popularized by sanatoria since small numbers of bacilli are detected in this manner that are not found by the simple smear method. One can readily see the significance of using this procedure in our routine county health department recommendations for supervision of quiescent or apparently arrested cases to determine their "menace" possibilities.

The taking of serial x-rays in sanatoria not only promotes proper handling of the patient, but provides the sanatorium with educational

material that should be passed on to county health departments by a direct duplicating or a photographic service. The use of newly developed films that give direct duplication of lights and shadows requires nothing more than a film view box and ordinary solutions used in processing x-ray films. Having worked out techniques for inexpensive photographic reduced duplicates, I am convinced that combining a word description with a diagramatic sketch and a small photograph of the chest film gives us our best method of reporting films and, if these are provided to county health departments for distribution to the physician in charge of the case, such reports would insure a highly co-operative and public minded medical profession. Many of the state tuberculosis case finding programs maintain a consultation chest film reading service for diagnosis and classification of patients. Sanatoria should maintain a consultation chest film service to assist in deciding upon the treatment possibilities in given cases. Chest films should be submitted on all applicants for admission to sanatoria. This would eliminate poor selections made by county health officers.

Well operated sanatoria should provide not only the patient's physician with periodic progress reports and a fully summarized report upon discharge, but should also send copies of these reports to the county health department. Interest in patients is thus maintained and good follow-up public health programs are encouraged. When collapse procedures have been started, a detailed outline of recommended therapy should accompany the general report.

Having dealt mainly with the usual value of sanatorium treatment from the county health departments' standpoint, I should like to propose a few other sanatorium activities that would further assist in the tuberculosis control work done by the county departments.

The previous training of most of our health officers and nurses did not include work in tuberculosis sanatoria. With adequate personnel, sanatoria could undertake to give short, intensive instruction and observation courses to all county health officers and nurses. In addition to this group, interested practicing physicians should be encouraged to spend some time in the sanatoria, learning particularly the possibilities and indications for collapse therapy. If they can spend sufficient time, the techniques of collapse measures could be taught. Having suitable quarters arranged for these visiting physicians will go far toward attracting them to sanatoria for study. Eventually, however, a plan of subsidizing part time clinicians will probably be worked out to operate pneumothorax clinics. This would relieve congestion in the sanatoria by enabling earlier discharging of patients. Physicians with sanatorium training are a big asset to a county health department in conducting all of its tuberculosis activities.

The statistical data in sanatoria is rarely analized because the demand of routine work upon the limited number of house physicians will not permit such analyses. Providing county health officers with data on the admissions from his county—as to race, sex, and age, with classification as to extent of pathology, and results obtained—would give him information that he could use in educating his lay groups. So many civic bodies have become interested in health work, and particularly tuberculosis control, that we can no longer afford to neglect our statistical and publicity data, so abundant in our sanatoria. It is possible that analysis of some of our figures would even result in changes for the betterment of sanatorium operation.

The suggestion has been made that beds be set aside in general hospitals to supplement inadequate sanatorium space and be used largely for the initiation of collapse measures. The idea has considerable merit, but for it to prove successful those in charge of the work should be sanatorium trained men with the proper medical and public health slant. Such sub-stations should be supervised by state sanatoria to insure uniformity of records, policies and therapy.

Most county health departments are equipped to show motion pictures. For local or state sanatoria to prepare films on tuberculosis control would be great for lay education in that section. If this is too big an undertaking, the preparation of exhibits of photographs and charts for county health officers would be of great educational value.

Aside from excellent service rendered sick and needy tuberculous patients, sanatoria have an even bigger service to render the

community and the state in the broader public health program of tuberculosis control.

I have attempted to show some of the ways in which sanatoria are of aid to the county health departments and to suggest a few additional activities that might be undertaken to increase this aid. The sanatorium is the hub about which all tuberculosis activities should revolve. Maybe this symposium to-day will add a little grease to the axle and permit a little more speed forward toward ultimate tuberculosis control.

Indications for Collapse Therapy*

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WHEN we think of collapse therapy we think first of artificial pneumothorax. This is the logical operation and, in many cases, the only procedure necessary. The phrenic crush, pneumonolysis, and pneumoperitoneum are only adjuncts to this treatment.

We are getting some wonderful results from thoracoplasty, but this should not be tried unless it is impossible to get the desired results with pneumothorax. There are rare cases in which a one or two stage thoracoplasty may be given the first choice. I have in mind the thick walled, apical cavity, even though it is possible to secure a very satisfactory collapse of all the rest of the lung. In two cases we have found it impossible to make any impression on the cavity even though there were no adhesions present, and the lung was fully collapsed except for the cavity. One felt that the only way it could be closed would be to get it in your hand and squeeze it. This was obviously impossible. And it must be remembered that failure to close the cavity renders all forms of collapse therapy of no avail.

Selection of Cases

All cases are not suitable for pneumothorax, and it is sometimes difficult to know which case will respond. Many cases which we consider unsuitable will respond very readily. Several years ago we saw a man who had been to three very excellent groups of men scattered over the eastern United States. Each group felt it was not worth while making an attempt, because they believed dense adhesions rendered it impossible to separate the pleura. After much missionary work we prevailed on the patient to allow us to try, and I have never seen an easier case.

The Acutely Progressive Case may give us very good results at first, but as treatment progresses we are often disappointed to find the case is slipping away from us. This is due to the fact that the resistance in the acute case is very low. He has not had time to build up this resistance with the result that the walls break down and the disease spreads.

The Chronic Case on the other hand, has had a long time to become adjusted, and over the period of months or years has had an opportunity to build up his resistance which is so very important a factor in the curative process. It may not be possible to get a complete collapse because of pleural adhesions, yet we are often surprised at the manner in which the patient responds.

The Cases which are not doing well. All men doing tuberculosis work know that a certain number of cases do well if placed on the regular treatment of strict bed rest, food and air. But, here again, it is impossible to tell which case will do well if left to itself, even though there is no cavity demonstrable. The question of resistance also enters in this type. In fact, the question of resistance is the main factor in determining whether the patient is going to get well or is going on to an unfavorable termination.

Therefore, all cases not doing well on the regular treatment should undoubtedly be given the benefit of pneumothorax.

Fibrosis

The fact that the case is one of fibrosis does not interfere with the selection, even though both lungs are involved. When I be-

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gan pneumothorax in 1923, if we found medium coarse rales to the third rib on the contralateral side, the case was deemed unsuitable. Today we pay no attention to rales on the contralateral side.

Cavities

It may be stated, as a general rule, that all cavities must be closed. I believe very few cases, far enough advanced to have cavities, will heal unless the cavities close either spontaneously or by other means. It is true that we may in a life time see several cavities which have closed without any outside aid, but they are very rare. I have seen two cases in fifteen years. It may be necessary to assist the pneumothoraces by phrenic crush, pneumonolysis, or pneumoperitoneum or resort may be had to thoracoplasty.

Thoracoplasty

I believe two factors enter into a successful thoracoplasty, and these two factors are so important that we would not consent to operate on a case in which they were not present.

First, is the most careful selection of the case. Here the education of the patient is of prime importance. You should have the confidence of your patient so that when you suggest this operation there should be no hesitancy on the part of the patient to accept it. Years ago many of us allowed the patient to decide when the operation should be done, with the result that many patients were operated upon when they were almost ready for the undertaker. Of course, they died, and it was not the fault of the surgeon. Today if a patient at Devitt's Camp refuses this operation when we suggest it, the operation is not performed at a later date unless the condition of the patient has remained the same.

The other factor which enters into a successful thoracoplasty is a skilled chest surgeon. And even here, I am frank to say, I would rather have a good patient and a moderately skilled surgeon than a poor patient and a more skilled surgeon.

Hemorrhage

It is in cases of hemorrhage that pneumothorax comes into its own. I know of no way to control a hemorrhage except by compression. I know of no drug that has any influence on it, but often 300 or 400 c.c. of air between the pleura seems to have a selective action and the hemorrhage ceases. In attempting this treatment, we must remember that we are dealing with a lung which is already broken, and if our enthusiasm or our fear impels us to exert too much pressure we may cause a larger rupture and do more harm than good. This is especially true if the tuberculous process has worked out near the visceral pleura causing adhesions, because we may pull off part of the visceral pleura. Care should be taken in each case of hemorrhage —worse things can happen than a slight hemorrhage. Of course, if the break occurs in a large vessel your patient will be dead in a few minutes—long before you can get the machine to his bedside. Fortunately, these cases are rare, indeed.

Sometimes it is difficult to know from which side the hemorrhage is coming. It is then a question of using your own judgement; and, after several pneumothorax treatments have been given, if the hemorrhage still persists, it may be necessary to induce pneumothorax on the other side also. In several of our cases this procedure has given us good results.

Bilateral Pneumothorax

It is good practice and good common sense that in bilateral cases both sides should not be started at the same time, except in certain hemorrhage cases which are difficult to control. Sufficient time should be allowed for the stabilization of the circulation, both respiratory and cardiac, before attempting the closure of the contralateral lung. If this precaution is taken, it is remarkable how well most patients handle a bilateral case. After the bilateral collapse has been established we prefer to give refills on both sides the same day. This tends to stabilize the mediastinum, and it is possible in this way to equalize the pressure on both lungs.

In some bilateral cases we find a walled cavity in one lung and a recent spread in the other lung. Matson has suggested closing the recent involvement first, disregarding the cavity. He has found it is often possible to bring enough pressure on the cavity by dis-

placing the mediastinum to get beneficial results. We have tried this procedure in several cases and are well pleased with it.

At the "Camp" we have a case getting pneumothorax on the right side who has had six ribs removed on the left side. This patient is doing very well.

The fact that both lungs are involved is no contraindication. Most cases that have advanced far enough to need collapse have already been infected on both sides. Generally there is a compensatory emphysema taking place in the contralateral lung. The alveolar walls and bronchioles become dilated so that the vital capacity is very little altered. It is true that sometimes the strain of adjustment is so great that the other lung may break down and even go on to hemorrhage. In these cases, it may be necessary to ease up the collapse and institute a pneumothorax on this lung.

Spontaneous Pneumothorax

Spontaneous pneumothorax should be converted into an artificial one, and this treatment continued until you have reason to believe that the spontaneous collapse was caused by some factor other than tuberculosis.

Positive Sputum

Positive sputum is always an indication for collapse therapy. While it is true that certain cases will become negative after six months of strict bed rest, I see no reason to wait if it is possible to do a pneumothorax. And remember—we should not be satisfied with a negative smear. Often a culture or guinea pig inoculation will prove these so called negative cases to be really positive.

We must always keep in mind the possibility of a spread to the other lung, or the formation of adhesions. I know of no factor which lessens the value of a pneumothorax as much as adhesions.

Pleurisy with Effusion

I believe, that in all cases of pleurisy with effusion the fluid should be aspirated and replaced with air. Often it is not necessary to strive for a complete collapse. But, inasmuch as this sign is very often one of the cardinal symptoms of tuberculosis, it behooves us to treat it as such.

If we allow the inflamed pleura to come in contact, adhesions almost invariably form, and all hope of a pneumothorax at a later date is lost. Very often a culture of the pleural fluid will demonstrate tubercle bacilli when the smear is negative.

Minimal Cases

Ten years ago it was thought that only advanced cases should receive the benefit of pneumothorax. Today most of us believe the early case is the important one. We believe that minimal cases which have shown no improvement, as shown by stereoscopic x-ray examinations, over a period of two months while on strict bed rest should have collapse therapy. We must remember that the more advanced a case becomes, the more danger we have of adhesions forming which may prevent a satisfactory collapse.

Miliary Tuberculosis

Miliary tuberculosis is not a contraindication. It is agreed that some few cases of miliary tuberculosis clear up spontaneously. If these cases are given an early collapse I believe that some of the results will be surprising. It is understood, of course, that this class does not at any time present a favorable prognosis. And it is all the more reason why we should give it all the assistance we can.

We do not believe pneumothorax should be started in the home unless in an effort to control a severe hemorrhage. Even then the patient should be removed to a sanatorium and kept there until the pneumothorax is well established. It should never be carried on unless the operator has, or has close access to, a fluoroscope. All cases should be fluoroscoped before being given refills.

Emphysema and asthma are contraindications unless the cause is found to be bacteria. Then, a vaccine may be of much benefit.

Intestinal and laryngeal involvement is not a contraindication. Homer Fishberg found that in his cases of pneumothorax who died —they all suffered from a severe intestinal tuberculosis, and we have had the same experience. Matson believes that he gets better results on left sided cases. He feels that the right sided case may not do well because of the pressure on the right heart, and the superior vena cava.

Some day I hope to see a standard for pneumothoraces. Today, some institutions are using it in ten per cent of the cases, while others are using it in seventy-five per cent of all cases. It is this fact, I believe, which caused the report at last year's National Tuberculosis Meeting to state that collapse therapy has not shown any decrease in the ratio of deaths between collapse cases and new cases. If taken from the lower brackets it is obvious why this would be so, but if taken from the seventy-five per cent bracket it should show a marked improvement.

It is just as important to collapse an early case of tuberculosis that is not doing well as it is to splint a fractured leg.

Those of us who are members of the American College of Chest Physicians recognize this, and are striving for it. This is also one of the aims of the scheme known as the Pennsylvania Plan, which has been adopted in 17 of our states.

Advances in Thoracic Surgery*

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THORACIC surgery has made rapid advances in the past few years, and now there need be no more hesitation in operating upon the chest than in attacking any other part of the body. In this paper I will attempt to review the common conditions amenable to thoracic surgery and outline our present concept of their surgical management.

Pulmonary Tuberculosis

Many cases of pulmonary tuberculosis are benefitted by thoracic surgery. Collapse therapy has been the outstanding development in the treatment of this disease within the recent years, and in our clinic every case of pulmonary tuberculosis is considered for some form of collapse treatment. If the diseased areas and cavities can be successfully compressed, many patients recover whereas, when cavities are allowed to remain open, the ultimate outcome is almost always unfavorable. The most satisfactory explanation for the benefit of collapse in my opinion is, that in a compressed state a relatively anoxemic condition exists which is unfavorable for the development of the tubercle bacillus.

Pneumothorax is the ideal form of collapse and is applicable to the largest percentage of cases. If a free pleural space exists, air can be introduced simply through a needle. This air must be replaced at periodic intervals, and the desired degree of collapse maintained under the guidance of the x-ray and fluoroscope. Both lungs can be partially collapsed simultaneously or alternately. At the expiration of treatment the lung will reexpand and function quite normally, the pulmonary disease frequently remaining healed. Unfortunately, pneumothorax is not possible in every case because of adhesions between the parietal and visceral pleurae and in these cases surgical measures must be instituted.

The most valuable surgical collapse measure is the thoracoplasty. This operation is merely a technical procedure to collapse the lung, and has been developed taking into consideration the architectural structure of the chest wall. At present, after passing through various stages of development, the operation has become more or less standardized. Complete lengths of ribs are resected from the transverse processes of the vertebrae to points close to the cartilage in front. The operation is performed in one, two or three stages, as may be necessary in the individual case, at intervals of several weeks with a resection of three or four ribs at each stage. Supplementary maneuvers such as the removal of the transverse process of the vertebra and mobilization of the apex after the manner of Semb [1] have been adopted in many clinics. While this may seem a drastic procedure, the fact remains that the operation is usually attended with very little shock, the mortality is low, the deformity not marked, and approximately 70 per cent of patients can be

* The Harold S. Boquist lecture delivered at the University of Minnesota, under the auspices of the Minnesota Health Association, May 9th, 1938. Reprinted from the Journal Lancet, Vol. LIX, N. 4, April, 1939.

restored to useful places in society.

The most simple surgical measure is the phrenic nerve operation, which also has a helpful place in the treatment of other conditions and as an adjunct to various thoracic manipulations. The phrenic nerve can be located easily as it crosses the scalenus anterior muscle of the neck, and may be interrupted either temporarily or permanently; temporarily, by crushing or alcohol injection of the main nerve and section of accessory branches, permanently, by section of the main nerve and accessory branches or by the evulsion or exairesis of the main nerve. Following interruption of the nerve the hemidiaphragm becomes paralyzed and rises to the expiratory position. Subsequently, there will be further rise as a result of atrophy of the muscle and the effect of the pressure relationship between the pleural and abdominal cavities. The net result is usually considered to be a 25 per cent collapse of the lung. This may distinctly benefit certain pulmonary lesions and close small cavities, but the phrenic nerve operation does not have the positive value of pneumothorax or thoracoplasty. In most clinics the phrenic nerve operation is used chiefly as an adjunct to other procedures, and the temporary operation is used more frequently than the permanent one. Judiciously used, the phrenic nerve operation has a valuable place in our collapse therapy armamentarium.

Occasionally, the adhesions which limit a pneumothorax collapse may be strings or bands which can be cut, thereby rendering an ineffective pneumothorax collapse a satisfactory one. This operation is called intrapleural pneumolysis. Most surgeons favor the Jacobaeus [2] operation, which is the severance of adhesions by the means of the closed operation involving introduction of the endoscopic instrument, similar to the cystoscope, into the thoracic cavity through the intercostal space. I have preferred to cut these adhesions through an open operation, feeling that larger bands can be cut more successfully and with greater safety. The more I use this method the more satisfied I am with the results and in the past several years I have had no untoward difficulties or complications.

In addition to these standard procedures we have a number of others of more or less limited application or questionable value. Various extrapleural packs, principally paraffin, have been tried and more or less abandoned, although they may have a limited field of usefulness. Cutting of the scalene muscles, intercostal neurectomy, open drainage of tuberculous cavities, adjunct or supplemental thoracoplasty operations, closure of the residual cavities by muscle transplants, and other procedures have been and are being used.

In recent years a comparatively new operation has been suggested, "extrapleural pneumothorax," and within the past few months I have attempted it in several cases with encouraging results. A section of the third or fourth rib is removed. The lung is separated from the chest wall in the fascial plane between the external surface of the parietal pleura and the endothoracic fascia. The apex is completely freed and the lung separated from the apical dome, the mediastinum, and the anterior, lateral and posterior chest wall, as far downward as may be desirable in the individual case. The remaining cavity is filled with saline solution and the soft tissues closed. Subsequently, the saline and bloody serum is removed faithfully from day to day and replaced with air, keeping a neutral pressure within this extrapleural space. There are certain theoretical objections and possible complications, but immediate results in my limited experience have been encouraging.

The program of control of tuberculosis lies principally in the recognition and isolation of open cases. Rapid progress is being made and efforts in the present direction seem to indicate that within a reasonable period of time the disease will be completely controlled. In the meantime, patients with the disease must be treated with the best methods we have at our commond and there are few procedures in medicine or surgery as strikingly effective as collapse treatment in pulmonary tuberculosis. The benefits are not only to the individual but also to the community, in that successful collapse converts the patient to a negative case, so he is no longer a source of infection to others.

Empyema

Empyema of the chest is a well-known condition which has been treated successfully for years, and yet the subject is confusing be-

cause of many modifications of treatment recommended. Progress in the treatment of this condition has been made in standardization of therapeutic procedures and in arriving at a better understanding of the principles involved. Any treatment which embodies fundamental principles will meet with more or less uniform success. We must differentiate sharply between ordinary pyogenic types of empyema caused by bacteria such as pneumococcus, streptococcus, staphylococcus and those caused by tubercle bacillus. In the pyogenic forms the following important points should be religiously kept in mind: first, adequate drainage must be established and maintained. Second, a cure of the empyema is accomplished when the lung is reexpanded to meet the chest wall and the pleural space is completely obliterated. Any form of the treatment must show continued progress in this direction, as evidenced by volumetric determination of the capacity of the pleural cavity or x-ray studies. If the progress of the patient is not satisfactory, or the cavity becomes stationary, the usual answer is inadequate drainage and more effective drainage must be established or a chronic empyema may result. Third, an open pneumothorax is, under ordinary circumstances, not compatible with life for any period of time. Likewise, open drainage of an early empyema where the exudate is seropurulent in character may be associated with respiratory disturbances that will contribute to an unfavorable outcome. The report of the empyema commission appointed during the world war to study this problem, cautions that a closed form of drainage should be used in early empyemas until there has been sufficient inflammation to fix the mediastinum, or until the lung is firmly adherent to the chest wall over an appreciable area. Practically, it is almost always safe to establish an open drainage when the exudate is frankly purulent.

The conventional forms of drainage are the closed and the open drainage. Aspiration may be considered a form of drainage, and repeated complete aspirations of the pleural cavity may accomplish a cure in many cases of empyema, especially in childhood. It is my opinion, however, that aspiration should be used primarily for purposes of diagnosis, to relieve increased tension which is causing dyspnea and cyanosis, and possibly in the early cases until it is safe to establish an open drainage. The ordinary interpretation of the closed form of drainage is the insertion of a catheter through the intercostal space with the aid of a trocar. The usual point for establishment of drainage is in the region of the ninth rib in the posterior axillary line, but needless to say the tube must be introduced into the empyema space as located with the aspirating needle, and entrances higher or in other locations may be necessary. Through this tube, which is introduced only a short distance into the empyema cavity, the pus is aspirated and the cavity irrigated at frequent intervals, most commonly with Dakin's solution.

Mechanical devices have been suggested for the purpose of continuous aspiration, continuous irrigation, tidal irrigation, etc., all of which may have some advantages. Let me repeat that this form of drainage is satisfactory only as long as there is progressive improvement of the patient and progressive diminution of the size of the empyema cavity. Drainage must be maintained until the pleural space is virtually obliterated. The closed method of drainage, then, is mandatory in early empyema, uniformly satisfactory for empyemas in children, and effective in many cases in adults. The open form of drainage with rib resections is generally favored by thoracic surgeons in the Chicago area as most effective in the management of the fully developed empyemas in adults. A rib segment three to five inches long is resected subperiosteally over the point determined to be the logical site for drainage in the individual case. Local anesthesia is usually sufficient, the most satisfactory general anesthesia for this operation and chest work in general, being cyclopropane gas. A liberal opening is established and this opening faithfully maintained, with the aid of tubes and gauze packs, until the cavity is virtually obliterated, at which time the wound is allowed to close. We also have various modifications of the open operation and various adjuncts to the treatment, such as efforts to hasten re-expansion of the lung. However, the process of ablation of the pleural space seems to be a natural one which will occur progressively if the drainage is satisfactory in the absence

of such conditions as malignancy and tuberculosis. Advantages of the open operation seem to be in shortening the period of convalescence, particularly hospitalization, and in requiring a minimum amount of care and irrigation. In favorable cases when the temperature is normal, patients can be encouraged to become ambulatory, often within a period of one to two weeks. The activity of the patient seems to aid the process of closure of the cavity. If these fundamental principles of treatment of empyema are observed, results will be uniformly satisfactory.

We still, however, are called upon to meet the very difficult problem of the chronic empyema. The first step here is to establish wide open drainage with the resection of multiple ribs and removal of the intercostal tissue. This in general, results in some improvement of the patient and some diminution in the pleural space. Later, plastic operations after the manner of the Schede [3] thoracoplasty, completely unroofing the cavity so the chest wall will be collapsed down to the visceral pleura and measures to close bronchial fistulae, etc., may come into consideration.

The problem of the management of the tuberculous empyema formerly seemed a hopeless one, in view of the nature of the underlying pathology. However, through the efforts of Alexander [4] of Michigan and others, the treatment of this condition has now been quite well standardized with amazingly successful results. We must consider three different divisions. First, is the simple tuberculous accumulation of pus with little underlying pulmonary pathology. Much can be accomplished here by simple repeated aspirations, with or without lavage of the pleural cavity with Dakin's or other solutions. (To minimize the danger of abscess of the chest wall and fistula the patient should be kept turned away from the needle puncture for a period of time after aspiration.) With patience and persistence we may find that soon there will be no further tendency for pus to reform and eventually we may even obtain a re-expansion of the lung. The replacement of the air and fluid with olive oil may be chosen, and this too, has resulted in apparent cures in a number of cases. Procedures to close the empyema cavity, principally thoracoplasty, have given many favorable results.

The second group is a simple tuberculous empyema with considerable underlying lung pathology, possibly open cavities. In these cases, aspiration, irrigation and oil likewise may be helpful, but if the condition of the other side permits, it is desirable to collapse the chest wall with the thoracoplasty operation, accompanied of course, by the removal of the purulent material. Bronchial fistula of a small size may be present and should encourage a use of surgical collapse.

A third group is the tuberculous empyema with secondary infection, with or without broncho-pleural or pleuro-cutaneous fistulae. Treatment in these cases will not be attended with uniformly good results, but nevertheless many can be saved. If no fistula is present the secondary infection can occasionally be overcome by repeated aspirations and irrigations, after which we will have the problem of the simple tuberculous empyema. If bronchial fistula is present, aspirations and irrigations may reduce the toxicity so that a radical thoracoplasty can be performed to obliterate the empyema cavity. The thoracoplasty is performed preferably before external drainage is established to minimize the danger of wound infection, but it may be wise to establish the open drainage early in order to improve the patient's general condition. In cases with an already present pleuro-cutaneous fistula, the procedure of choice usually is to enlarge the drainage opening with the view of improving the patient's condition to a point where he will tolerate the necessary thoracoplasty operation. In spite of adequate drainage, however, some of the secondarily infected tuberculous empyemas will not respond and continue their toxic course to unfavorable termination.

Lung Abscess

Lung abscess is another surgical problem in which the advance has been primarily towards the standardization of therapeutic measures. About 50 per cent of lung abcesses develop following operations upon the upper respiratory tract, possibly more frequently when general anesthesia is used. There has been debate as to whether the abscess results from the aspiration of infected material,

(Continued on page 26)

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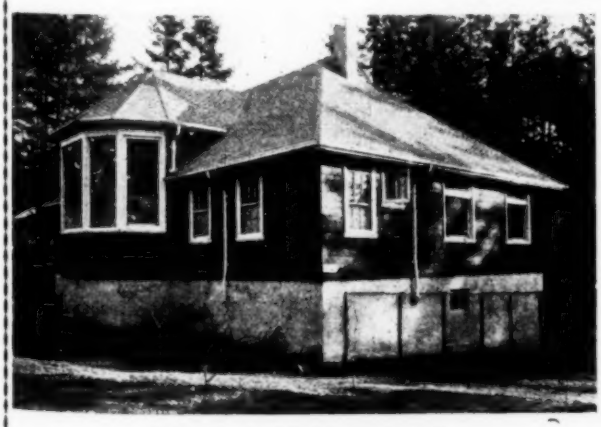

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or whether the infection is carried through the blood stream. Probably infection occurs through both routes. Pneumonia, foreign bodies, metastases from other points of infection, trauma, etc., are the other etiological factors. The final diagnosis is made by the history, physical examination and laboratory tests. As in the case of other accumulations of pyogenic material, drainage must be established. Evacuation into the bronchus frequently occurs and this alone may constitute completely adequate drainage. We find that 75 per cent of lung abscesses heal spontaneously and therefore the only necessary treatment is the usual supportive measures.

In the remaining 25 per cent of cases, drainage through the bronchus will not be sufficient and surgical drainage must be established. The conventionally accepted plan is to continue ordinary medical measures as long as there is progressive improvement of the patient, diminution in the amount of sputum, and progressive closure of the abscess cavity as evidenced by x-ray examination. However, if after an arbitrary period of six to twelve weeks there is still temperature, sputum and an abscess cavity of significant size, surgical drainage should be instituted. While each abscess presents different problems, the general outline of surgical drainage is as follows: The abscess is localized as well as possible by physical and laboratory measures. The most significant localizing finding in my experience was given to me by the late Carl Hedbloom [5]. He stated that the point of maximum dullness to percussion is the point where the pathology is nearest the surface. Advance roentgenological facilities, if available (laminography) might be more accurate. A rib resection is performed over the chosen point and the external surface of the parietal pleura exposed. If the pleura is thin and transparent and we can see the underlying lung mottling, there are probably insufficient adhesions to make it safe to enter the lung abscess at the first operation. If the pleura is thick and opaque and resistant, there are adhesions so that drainage can be established at one sitting. To transgress the free pleural space and enter the lung abscess would mean a spontaneous collapse of the lung and its associated disturbances and the development of empyema, which might prove disastrous. Most frequently we pause at this point and tuck a gauze pack against the outer surface of the parietal pleura over an area of four to six square inches, close the soft tissues, and allow the pack to remain in place for one week, during which time the inflammation caused by the gauze will have resulted in the formation of adequate adhesions.

At the second stage the abscess is located with the aspirating needle by the recovery of purulent material or foul smelling air. The lung is then entered, principally with the use of electro-coagulation, cautery or blunt dissection. A liberal drainage opening is established and the septa between communicating pockets broken to insure adequate drainage. A gauze pack is inserted snugly into the abscess and along the course of the drainage tract, which is maintained patent with the aid of tubes and packs until the abscess cavity has granulated and shrunken down to a minimum size, after which the wound is allowed to close gradually from the base. Results of surgical drainage at the proper time are more or less uniformly satisfactory and successful. However, the surgical results are usually judged by results in those cases of chronic multiple abscess which have been neglected and kept for too long a period of time under conservative management. Also, there may be other problems such as the necessity of surgical obliteration of the residual space, treatment of bronchial fistula, etc. The conventional medical treatment for years has been the intravenous injection of neosalvarsan, and this drug probably should be used wherever there is a predominance of spirochetes in the sputum. Bronchoscopic drainage undoubtedly has a place in the treatment of lung abscess and occasionally the opening into the abscess cavity can be enlarged, thereby improving drainage. Postural drainage methods are helpful. Preparations containing iodides and guiacol have been recommended. Pneumothorax treatment of abscess, in my opinion, is to be condemned. I have recently seen two cases which developed empyema following pneumothorax treatment, and the presence of a pneumothorax definitely conflicts with a program of surgical therapy. The introduction of a needle into the lung for the purpose of diagnosis without the accurate

(Continued on page 28)

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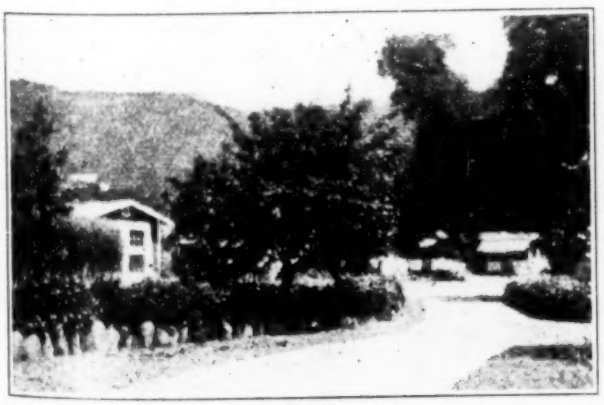

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knowledge of an obliterated pleural space can definitely be condemned. Chronic multiple abscesses become virtually the same problem as extensive chronic bronchiectasis with abscess formation and will be considered under that heading.

Bronchiectasis

Bronchiectasis is a condition of dilitation of the bronchi, which presents one of our most difficult surgical problems. Varying degrees and types of involvement occur and, although the left lower lobe is most frequently affected, any one or multiple lobes may be involved. Congenital and acquired types are recognized. The factors in the development of the acquired type are: first, an infection weakening the bronchial wall, and second, a dilating force. This dilating force, probably is the atmospheric pressure acting against the negative intra-thoracic pressure.

Symptoms in bronchiectasis are manifest when infection is present and the conventional forms of treatment are largely directed towards overcoming this infection. Removal of foci of infection, postural drainage and climatic changes have often resulted in some benefit. Bronchoscopic drainage has some value. The phrenic nerve operation has been strongly advocated, but observations of many unfavorable results have cast a shadow of doubt as to the efficiency of this procedure. X-ray treatment recently has been suggested, but I fail to see how it can be of great benefit. Instillation of lipiodol as a therapeutic measure has been used, usually with only temporary benefit. Pneumothorax is usually impossible because of adhesions, and thoracoplasty has given very little encouragement.

The usual story is that of only transient improvement and almost inevitably there will be succeeding re-infections of greater severity with increased pulmonary damage and discouraging results. The general opinion among thoracic surgeons is, that the only complete cure consists in removal of the diseased tissue, lobectomy. This operation has been formidable in the past, but as a result of improved understanding of the physiology of the chest, added experience, and better standardization of the operative procedure, we now find many successful reports, some with mortality comparable to other generally accepted surgical procedures. In a young individual with pronounced symptoms, cough, sputum, and toxemia where the disease is limited to one lobe, lobectomy should unquestionably be seriously considered.

Every surgeon has different points in technique, but the general tendency is to favor a single stage operation. The approach is made with the removal or section of one or more ribs in a location that will be most advantageous for exposure of the hilus of the lobe. The lobe is freed and a mechanical ligature placed around the hilus. The diseased tissue is then cut away and the blood vessels and bronchi secured with great care. Subsequently, there will be problems such as maintaining proper pressure relationships, combating the inevitable infection of the pleural cavity, and filling in the residual space. The closure of this space is usually accomplished by compensatory expansion of the remaining lobe, possibly aided by paralysis of the diaphragm. Sometimes a thoracoplasty operation is required.

In some cases a two stage operation is preferable. Removal of multiple lobes is not impossible. Extensive chronic bronchiectasis with abscess may be best handled by cautery lobectomy as suggested by Graham [6]. This operation consists in a gradual destruction of the diseased tissue in several stages. Although perhaps the only resort in this type of case, it has proven too extensive to receive general acceptance.

Carcinoma of the Lung

Tumors of the chest wall, the mediastinum and the lung also come within the field of thoracic surgery. The most important of these is a primary bronchiogenic carcinoma. While this condition was considered very rare a few years ago, we now find it comprises about two per cent of all primary malignancies. The increase may be merely relative and accounted for by increase in the life span and more accurate diagnosis, or may be absolute as a result of the increase in smoking or the increase in inhalation of various irritating gases and fumes in our present civilization. The possibility of carcinoma of the lung must be kept in mind in patients in the cancer age. Chest pain, irritative non-productive cough, or hem-

(Continued on page 30)

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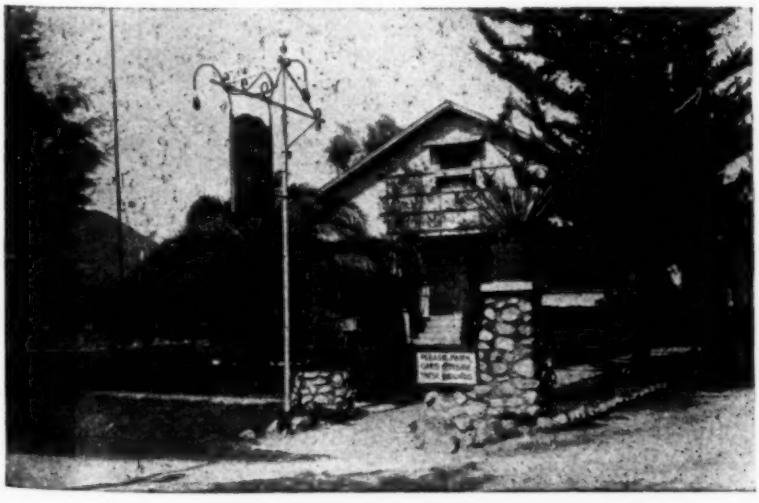

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optysis may be early symptoms, or the first evidence may be circulatory obstruction or metastasis to other parts of the body. The principle physical findings are those of the atalectasis which occurs as a result of the bronchial obstruction, namely, impaired resonance and diminished to absent breath sounds over the affected area. Likewise, the predominant x-ray finding is often a wedge-shaped shadow of atalectasis which may involve only a lobule or a complete lobe or the complete lung. The presence of superficial lymph node involvement may occasionally show metastasis, and in several cases we have been able to find malignant cells in the sputum or pleural exudate in cases where other measures have failed. The presence of bloody pleural fluid suggests a malignant condition of the lung or pleura. Bronchoscopic examination with biopsy most frequently leads to definite confirmation of diagnosis.

The only possibility of recovery lies in surgical removal of the tumor, and this usually means removal of the entire lung. Graham [7] was the first to successfully remove a lung for carcinoma, and since then there have been many isolated encouraging successes. Certainly in view of the outlook of the inevitable exitus without surgery, cases in which no definite metastasis can be located should at least receive the benefit of exploration in spite of the formidableness of the operation.

Other Fields

Surgery of the diaphragm, esophagus, thoracic sympathetic chain, and the problem of management of crushing and perforating injuries to the chest wall belong within the sphere of thoracic surgery, but we will not have time to discuss them at this time.

Heart

Many outstanding medical figures have insisted that operations on the heart would be impossible. Nevertheless, as stated by Cutler [8], the heart can be manipulated as any other organ or tissue. Isolated reports of repair of injuries of the heart have been reported, and now, clear indications for such operations are recognized. Delorme in 1898 [9] suggested resection of the pericardium for cases of adhesive pericarditis and recently numerous successes have placed this procedure in a generally accepted classification. Purulent pericarditis requires surgical drainage. Bold attempts have been made to enlarge cardiac valves in cases of stenosis, and Cutler and Beck [10] have performed such operations with some apparent success. Allen and Graham [11] have devised operative procedures and surgical instruments called cardio-valvulatomes.

Successful repair of aneurisms have been reported. Trendelenburg in 1908 [12] reported a series of cases with removal of pulmonary thrombi and this operation bears his name. Attempts have been made to relieve angina by resection of the cervicle sympathetic chain, Jonnesco [13], and by thyroidectomy, Blumgart [14], Levine and Berlin. Attempts to relieve hypertension by section of the thoracic sympathetic chain and the splanchnic nerves have also been made with temporary successes.

More recently recognizing the mortality from interference with the circulation of the heart itself, coronary occlusion, Beck [16] and also O'Shaughnessy [17] have performed operations to encourage collateral circulation by bringing the omentum up through the diaphragm and tacking it to the heart and pericardium. Immediate results have been encouraging.

Conclusion

In view of already attained unbelievable success, we can not be too skeptical as to the possibilities for the future.

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Organization News

H. I. Spector, M.D., St. Louis, Governor of the American College of Chest Physicians in Missouri, was the guest of the Sedgwick County Medical Society, Wichita, Kansas, at their third Spring Clinical Assembly on Tuesday, March 21, 1939. In the morning he spoke on the subject of "Treatment of Pulmonary Tuberculosis with Special Emphasis on Collapse Therapy." At the noon meeting he conducted a round-table discussion and in the evening he spoke on the subject of "Differential Diagnosis of Haemoptysis."

A. L. Banyai, M.D., a Fellow and Governor of the American College of Chest Physicians for Wisconsin, gave a talk at the meeting of the Medical Society of West Allis, West Alis, Wisconsin, on April 4, 1939. His subject was "Tuberculosis and the General Practitioner."

Miquel Canizares, M.D., Manila, Governor of the American College of Chest Physicians for the Philippine Islands, was elected President of the Manila Medical Society. Congratulations.

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